BUILDING A CASE FOR SUSTAINABLE MANAGEMENT OF PRIVATE WOODLANDS

CASE STUDY: MURRAY SCOTT WOODLOT

What factors motivate private woodland owners to manage their woodlots sustainably? For some it is personal interest or stewardship ethic, while others may be more influenced by potential for economic returns.

This is one of several case studies profiling woodland owners who have not only demonstrated long-term stewardship of their forests, but have also documented financial returns over the years. The case studies have been undertaken, in part, to investigate if economic returns from woodlots can compare favourably with those from agriculture. Returns from these managed forests (mostly from timber sales but possibly including other activities such as production of maple syrup) have been compared to the income from agricultural crops on comparable land over the same period.

It is hoped these case studies will provide incentive for woodlot owners to manage their woodlots responsibly, either by demonstrating the potential for enhanced long-term financial returns or through the example of responsible stewardship provided by the woodland owners profiled in the case studies.

We appreciate the assistance of the woodland owners who have so generously shared their stories with us.

Part One: The Scott Woodlot Story

As Murray Scott bounces along the trails of his woodlot on a four-wheeler he can recite the history of every corner of the bush. It's a lot of history with the 100 acres spreading over the back end of two 200-acre farms that have been in the Scott name since the land was settled in 1857.

Back then brothers Walter and David left their family in Halton County and walked up the Huron Road (now Highway 8) to Clinton, turning north on a trail until they found the 200-acre lots each took up near Belgrave in what was then East Wawanosh Township. Murray, a descendent of Walter, grew up on his family's home farm but in 1963 bought the farm next door originally settled by David.

The Scotts have always felt trees were a big part of their farm and Murray and his wife Wilma, the record keeper on the farm, have the figures to prove it. Over nearly 40 years they've taken more than 600,000 board feet of lumber out of the 100-acre bush.

Those records also show that, unlike other farm products where the price seems to stay the same despite inflation, income from each tree harvested from the woodlot has been increasing in value. Back in 1964 when the young couple made their first harvest after buying their farm the previous year, they received $120 per 1000 board feet of maple lumber. In 2000, they received $2,000 per

1000 board feet for veneer-quality maple and $1,000 to $1,500 for the rest of the hard maple.

Through 40 years of management, Murray has aimed to produce more veneer-quality maple by taking out the lower-quality trees to let the best quality grow. By that 2000 harvest, 40 per cent of the maple cut reached the top prices in the $1,500 to $2,000 range.

With a woodlot that big, the normal impression that you have to wait for a long time to see money from a woodlot is also proven wrong. In the past decade the Scotts have harvested every two to three years: four harvests in all totalling 270,000 board feet.

Another harvest in 2004 yielded a value of $59,727. Given that Murray and Wilma are involved in a beef cattle operation with Murray's three cousins in a limited company called Scottslea Farms Ltd., the revenue from the woodlot proved handy given the situation in the post-BSE world. Again history comes to the fore here because it was a major infusion of cash from a harvest of the bush that helped save the farm back in the crisis years of the 1980s when high interest rates collided with low beef prices.

The woodlot, stretching across four farms, provides an interesting laboratory about woodlot management when you look at each 25-acre lot. His father liked trees, Murray says, and liked to look at them so much he probably didn't cut them as often as he should have. The result was an overly mature bush that had too many large trees and not enough variety of tree development in the 25 acres of bush on his home farm. So when the bush was marked by Ministry of Natural Resources technicians in the 1970's and became the first woodlot in the are sold by auction the result was a cut that, in hindsight, Murray feels left the bush too open. Things probably would have been all right even with that severe cut but several dry summers contributed to more damage to the remaining trees. With some trees suffering from die-back a second cut was required some years later.

Each of the 25-acre sections of the woodlot has a different character because of past management practices. A goal would be to have each of the sections have a different harvest but generally there are a few trees throughout the bush that are ready to be cut whenever a harvest is taken. Even a couple of trees per acre at 300-400 board feet each provides a good per acre income, he says.

Scott stops by one of his favourite maples that stands tall and straight, stretching up perhaps 50 feet to the first limb. He takes out a caliper that shows the tree measures 29 inches in diameter. Taking out a chart he shows that at that measure, there would be 508 board feet of lumber in the tree.

"At veneer log rates this could be a $1,000 tree," he says. The extra girth of the tree shows the value of letting trees reach their potential past the minimum-diameter cutting limits in municipal tree bylaws, he says. A 20-inch diameter tree would yield only 370 board feet. Often a tree can put on much more wood per year after it reaches the minimum diameter limit than before.

Being a beef farmer used to measuring performance of his animals, he has always had a goal to select a number of trees and measure them regularly to track their performance. "I think you'd find that there are trees that perform and trees that don't perform," he says. He has taken a lot of advice on management over the years from Alan Craig, who operated Craig Sawmill in nearby Auburn until it closed several years ago. From Craig he learned that a healthy looking tree with tight bark had more good growth in it. A tree with loose bark was probably not going to grow much more and should be harvested.

Eight of the 12 sales they've made since 1964 had been to Craig's and Scott credits the marking skills of the company with the general health of the bush today.

The bush is mostly hard maple with some basswood, beech and cherry. The beech population has declined over the years because at one time beeches were almost considered a weed tree, he says, but the idea of diversity in a bush is much more highly regarded today.

Also a big loss was elms which were hit by the Dutch Elm Disease epidemic of the 1970's. After those trees were removed there was a substantial regrowth as young trees sprang up, but sadly most

of these have died off in the last few years as well. Before the disease hit, the bush had a rock elm section and during a harvest in about 1952, 90-foot long logs were taken out to be trucked to the Collingwood Shipyard.

A road system has been established throughout the bush to make cutting and skidding as efficient as possible and reduce injury to nearby trees. As well as being practical, this is also a pleasure for Scott who says he has a dream of a trail extending from Belgrave to the Wawanosh Nature Centre on the Maitland River west of his farm. Currently trails go about half that distance, he says.

Pleasure also comes from the wildlife the large, extended forest attracts with deer having a sheltered run from Belgrave Creek in the east to the Maitland River to the west. And there's the relaxation the woodlot provides.
"Sometimes when Wilma can't find me it's because I'm back here in the bush," he says.

Murray Scott measures a black cherry tree in his woodlot

Is This Forest Being Managed in a Sustainable Way?

It is reasonable to ask if the forests profiled in these case studies are being managed sustainably, or if the growing stock may have been sacrificed in the interest of short term economic gain. In an effort to answer this question an inventory was carried out in several of the case study sites and the data compared to the recommended stand structure diagram for tolerant hardwoods in Site region 6E (which includes much of the area where these case studies are located). The stand structure diagram (see "Recommended" curve in Figure 1) represents the ideal size class distribution in an all age forest being managed under a single tree selection system, as is recommended for upland tolerant hardwood forests such as the one represented in this case study. The "y" axis represents the number of trees per unit of area, while the "x" axis represents the diameter at breast height (dbh) of the trees. The resulting curve, often referred to as a "Reverse J" curve, is representative of trees found in a well managed stand, i.e. many trees in the smaller size classes and progressively fewer as size increases. When the stand structure of the Scott woodlot is compared to the recommended distribution there are some minor differences (i.e. a surplus of trees from up to 30cm and a deficit above 50 cm). While it would be preferable if there were more trees 50 cm (20 inches) and over, on the whole the Scott structure compares quite favourably with that recommended, allowing us to conclude that the forest is in a reasonably good state of management.

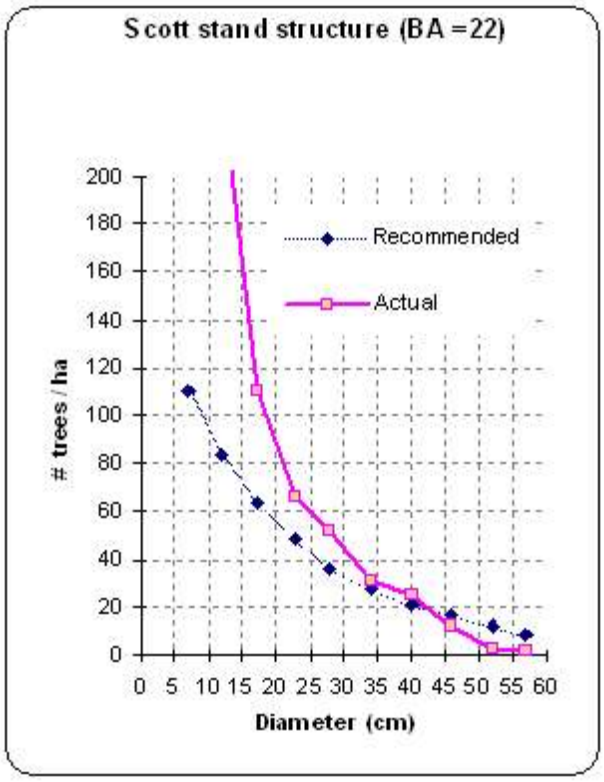

Figure 1

Part Two:
Economic Comparison of Woodlot and Crop Production for the Scott Case Study

The objective of this economic analysis was to compare historical returns from the Scott woodlot to that from agricultural crops on comparable land over the same period. In order to make the comparison, a crop rotation was selected that would have likely been used in this area (see Crop Production Model description). Using historical returns for these crops a Net Present Value (NPV) calculation was used to estimate the returns in 2004 dollars (see Net Present Value description). The NPV of returns from woodlots and the crop production model are listed in Table 1.

Economic information for the woodlot was obtained through a personal interview with the landowner. Actual revenue and costs were collected for each forest operation for which data was available (In the Scott case this stretched back to 1977). Profits (or margin) were determined (revenue minus costs), then a Net Present Value calculation was used to estimate a 2004 value for returns from the woodlots.

The NPV of returns were then calculated on a per acre basis and summed over the time period since 1977 in order to compare returns from the woodlots to that from agricultural land.

Net Present Value
Typically sales from agricultural crops are made on an annual basis, while sales from woodlots are made only periodically. In order to compare them in a way that is economically valid, a Net Present Value (NPV) calculation is done to estimate the value sales would have at a future date (for this case study 2004 was used). The NPV calculation assumes that the profit (or margin) from sales is invested and compounded (i.e. the interest is added to the total investment annually) until the date that is to be used for the comparison. A 5% return was felt to be most realistic and is reflected in most of the tables, however calculations for 7.5% and 10% were also used and are mentioned periodically as well.

The Scott Farm
Background information on the farm and forest is found in Table 2. There are 100 acres of upland hardwood woodlot on a 400 acre farm in Huron County. It has been in the Scott family since 1856. The woodlot has never been pastured. Some tapping for maple syrup occurred prior to the 1950's, but none since. The agricultural land is rotationally cropped (wheat, soybeans, corn and hay) as cash crops or feed for their beef cattle operation. There have been eleven harvests in various portions of the woodlot between 1977 and 2004.

Crop Production Model
Representative crop models were developed by region for typical crop rotations in Ontario using corn, soybeans & wheat. The representative farm model was based on crop enterprise budgets developed by the Ontario government, which reflect industry average costs and returns. Both variable and fixed costs were used in the calculations. Although fixed costs do not change with changes in acreage, overall fixed costs, including depreciation, must be covered to maintain long-term profitability. (Fixed costs do not include land rent or interest on land.)

Historic crop enterprise budgets were not readily available for all the required years. For the years that data was not available, values were estimated by averaging the total costs. To accommodate changes in reporting of crop enterprise budgets over the years, estimates using linear trends and averages based on the available historic numbers were determined.

Crop yields and prices are cyclical in nature, so the order of the crop rotation would have an impact on the end results The crop model was evaluated assuming the rotation planted 1/3 to corn, 1/3 to soybean and 1/3 to wheat annually. The present value of the rotation was used for the purpose of comparison with the woodlot per acre revenue.

Comparison of Returns

The economic analysis indicates that between 1977 and 2004 the Scott woodlot has generated a total of $778,142 in revenue from timber sales, while costs were $600, resulting in a margin of $777,542 (in 2004 dollars, assuming a 5% compound rate). Given there are 100 acres of woodlot, the total eanings have been approximately $7,775 per acre between 1977 and 2004 (assuming a 5% compound rate). The results using 7.5% and 10% compound rates are $11,793 per acre and $18,357 per acre respectively.

Table 1 summarizes returns from the woodlot $7,775 to $18,357 per acre (depending on the compound rate applied) and compares them to the returns from a crop enterprise budget for a corn, soybean, wheat agriculture rotation over the same time period - $3,148 to $6,937 per acre.

Summary

The results of this analysis indicate that the Scott woodlot was able to generate substantially more revenue per acre from 1977-2004 than a typical crop rotation of corn, soybeans and wheat in western Ontario. At the various compound rates the difference between woodlot management and crop rotation ranged from $4,627 (147% higher for woodlot) to $11,420 (165% higher for woodlot) more in profit per acre. See the tables below for a summary of the data. There has been no value assigned to the value of fuelwood sold or used for personal consumption.

This analysis does not attempt to place a monetary value on the many other woodlot benefits such as site protection, contributions to water quality or groundwater recharge, opportunities for recreational use, etc. It is typically more difficult to place a dollar value on these benefits, although in some locations landowners are charging for access or leasing hunting and fishing rights.

Table 1: Summary All Sources of Income (1975 - 2004) From the Scott Woodlot (Present Value, $/acre)

Source of Income	5%	7.5%	10%
Timber Sales	$ 7,775	$ 11,793	$ 18,357
Fuelwood Sales			
Woodlot Total	**$ 7,775**	**$ 11,793**	**$ 18,357**
Average Crop Rotation	$ 3,148	$ 4,619	$ 6,937
Difference	**$ 4,627**	**$ 7,174**	**$ 11,420**

Note: columns may not sum correctly due to rounding

Table 2: The Scott Farm Land Use and Forest Description

Land use	Description	Hectares (acres)
Forest	Predominately sugar maple, but includes beech, ash, black cherry, etc. Rolling terrain - loamsoils.	40 (100)
Agriculture	Including farmstead, workable land plus other riparian and natural areas	120 (300)

Table 3: Present Value (2004 dollars) of Corn, Soybeans and Wheat Rotation (at 5% rate) *(i)*

Year of Harvest	Actual Revenue/Acre	Actual Cost/Acre	Present Value Revenue/Acre	Present Value Costs/Acre	Margin/Acre
1977	175.18	153.86	654.04	574.44	79.60
1978	187.82	156.95	667.82	558.05	109.77
1979	228.78	162.85	774.74	551.46	223.28
1980	281.23	169.27	907.00	545.92	361.08
1981	243.06	183.77	746.57	564.46	182.11
1982	218.76	202.77	639.93	593.16	46.77
1983	292.75	201.11	815.59	560.27	255.32
1984	269.18	211.98	714.22	562.45	151.77
1985	249.87	220.01	631.41	555.97	75.44
1986	200.38	213.42	482.24	513.62	-31.39
1987	284.95	208.84	653.12	478.66	174.46
1988	258.38	203.48	564.00	444.17	119.83
1989	232.78	229.67	483.94	477.46	6.48
1990	240.71	209.62	476.58	415.04	61.54
1991	253.37	204.77	477.76	386.13	91.64
1992	209.88	214.90	376.91	385.93	-9.02
1993	279.24	225.03	477.59	384.87	92.72
1994	298.29	228.72	485.88	372.55	113.33
1995	441.77	232.41	685.33	360.54	324.80
1996	336.96	239.27	497.84	353.51	144.33
1997	335.22	246.14	471.68	346.34	125.35
1998	281.97	253.17	377.87	339.27	38.61
1999	310.15	243.24	395.84	310.44	85.41
2000	267.59	254.03	325.26	308.77	16.48
2001	266.90	256.12	308.97	296.49	12.48
2002	373.39	251.46	411.66	277.23	134.43
2003	352.94	270.33	370.58	283.85	86.73
2004	368.67	293.67	368.67	293.67	$ 75.00
Total					**$ 3,148.35**

Note: columns may not sum correctly due to rounding

(i) Using data from the historical crop enterprise budgets it was possible to calculate the total revenue and costs per acre for each of the harvest years of the crop rotation. The crop rotation assumes that the corn, soybean and wheat rotation is based in western Ontario and uses values from that area. Using the 5%, 7.5% and 10% compound rate, the NPV revenue and costs per acre were determined for each crop rotation. The present value costs were subtracted from revenue to determine the NPV margin per acre. As identified in the table above, the total margin for the crop rotation over the 28 year time period from 1977 to 2004 (expressed in 2004 dollars, using a compound interest rate of 5%) was $3,148 per acre. For 7.5% and 10% compound rates, net present values were $4,619 and $6,937 per acre respectively.

Table 4: Present Value of Timber Sales from the Scott Woodlot (at 5% rate) (100 acre - woodlot)

Year of Harvest	Volume Harvested (fbm) *(ii)*	Actual Revenue	Actual Costs *(iii)*	Present Value of Revenue	Present Value of Costs	Present Value of Margin	Present Value Margin/Acre
1977	22,600	3,947	0	14,736	0	14,736	147
1978	137,934	41,500	0	147,560	0	147,560	1,476
1980	?	600	0	1,935	0	1,935	19
1981	200,000	80,500	0	247,258	0	247,258	2,473
1984	?	1,400	0	3,715	0	3,715	37
1988	71,532	35,775	0	78,092	0	78,092	781
1992/93	175,446	61,973	0	105,995	0	105,995	1,060
1995	13,849	9,937	0	15,416	0	15,416	154
1998	31,260	28,799	0	38,593	0	38,593	386
1999/00	48,588	53,570	0	65,115	0	65,115	651
2004	37,006	59,727	600	59727	600	59127	591
Total (1977 -2004)				**$ 778,142**	**$ 600**	**$ 777,542**	**$ 7,775**

Note: columns may not sum correctly due to rounding

(ii) (fbm) foot board measure (board feet)

(iii) Marking for harvests from 1977 through 2000 were done at no cost through Ministry of Natural Resources programs. The 2004 harvest was marked by a consultant.

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